	L #	Hits	Search Text	DBs	Time Stamp
1	L1	4	("6607790").PN. Grandchild of CIP parent	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2007/01/12 13:52
2	L2	0	L1 and (stress tensile compressive intrinsic)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2007/01/12 13:58
3	L3	2	("5571571").PN. Patent being treated in this Reissue	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2007/01/12 13:57
4	L4	1	L3 and (stress tensile compressive intrinsic)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2007/01/12 13:58

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US-PAT-NO:	5571571
DOCUMENT-IDENTIFIER:	US 5571571 A
TITLE:	Method of forming a thin film for a semiconductor device
DATE-ISSUED:	November 5, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
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US-CL-CURRENT:	427/574, 257/E21.278 , 257/E21.279 , 427/563 , 427/575 , 427/579 , 438/784 , 438/789

ABSTRACT:

A method of forming conformal, high quality silicon oxide films that can be deposited over closely spaced, submicron lines and spaces without the formation of voids, comprises forming a plasma of TEOS and a selected halogen-containing gas in certain ratios. By proper control of the energy sources that create the plasma, the proper selection of the halogen-containing gas and selection of other processing parameters, high deposition rates can also be achieved.

10 Claims, 34 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 9

US Patent No. - PN (1):

5571571

Brief Summary Text - BSTX (14):

Weise et al, PCT application US92/04103, describes the reaction on an inorganic substrate of unsubstituted silane (SiH.sub.4) together with a halogen-containing gas and an oxygen-containing gas by PECVD or ECR CVD techniques. Alternatively the precursor gas can be an organosilane. An etchant is added along with the precursor gas or gases. Suitable etchants listed include fluorine-containing compounds and halogens, but the preferred etchants are HF or NF.sub.3. Sulfur-based or carbon-based etchants are not preferred however, because it is stated that residual sulfur or carbon remains in the films, which is undesirable. Halogens are not preferred either, because they corrode the reaction chamber and other equipment. As is well known, NF.sub.3 and HF are also corrosive, particularly to quartz parts. The addition of NF.sub.3 to the silicon oxide film reduces intrinsic stress in the film, and also reduces the amount of hydrogen present in the film, which has a high dielectric constant. However, this process leads to films having low compressive stress, which leads to semiconductor devices with unsatisfactory electrical properties, and inferior mechanical properties. The process also exhibits low deposition rates.

Drawing Description Text - DRTX (15):

FIG. 13 is a graph of stress versus C.sub.2 F.sub.6 gas flow using TEOS as the reactant gas for silicon oxide films of the invention.

Detailed Description Text - DETX (9):

When the widths of the respective aluminum strips and of the corresponding spaces between the strips are comparatively large, as shown in FIGS. 4A to 4D, the sidewalls of the silicon dioxide layers 72a to 72d have a smoothly tapered configuration. However, even when the widths of the respective aluminum strips and of the corresponding spaces between the strips is in the submicron range, as shown in FIG. 4E, the sidewall configuration of the silicon dioxide layer 72e is straight, and the possible creation of voids is greatly reduced. When the width of the respective aluminum strips and the corresponding spaces therebetween is reduced even further, in the submicron range, as shown in FIG. 4F, the spaces between the aluminum strips 70f are buried by the silicon oxide layer 78f, without the formation of any voids in the film. Since the sidewalls obtained with the configurations shown in FIGS. 4E and 4F have a fine compositional structure, an enhancement of the quality is achieved. The compressive stress of the above film was found to be 1.times.10.sup.9 dynes/cm.sup.2.

Detailed Description Text - DETX (21):

The silicon oxide film obtained contained about 4.3% of fluorine. In this case, using a single frequency, the deposition rate of the silicon oxide was reduced to about 2500-3000 angstroms per minute. The compressive stress of this film was about 2.times.10.sup.8 dynes/cm.sup.2.

Detailed Description Text - DETX (26):

The application of low frequency power decreases the deposition rate, but improves compressive stress, slightly increases the wet etch rate, lowers R.I. and increases the gap filling capability. The application of high frequency power slightly reduces the deposition rate, does not affect the compressive stress of the films, slightly increases the wet etch rate, slightly decreases the R.I. and slightly increases the gap filling capability.

Detailed Description Text - DETX (32):

FIG. 13 is a graph of C.sub.2 F.sub.6 flow rate versus stress of the silicon oxide films, showing reduced stress with higher C.sub.2 F.sub.6 flow rates and higher fluorine concentration in the films.